

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

SPOILAGE OF TOMATOES IN TRANSIT, AS SHOWN BY INSPECTION CERTIFICATES, 1922 TO 1930

By NEIL E. STEVENS, *Senior Pathologist*, and NELLIE W. NANCE, *Senior Scientific Aide*, Division of Mycology and Disease Survey, Bureau of Plant Industry

ECONOMIC IMPORTANCE OF FRUIT ROTS OF TOMATOES

Since the inception of the food-products inspection service of the Bureau of Agricultural Economics and that of the work in market pathology by the Bureau of Plant Industry, which developed coincidentally, it has been recognized that tomatoes are very susceptible to decay in transit and on the market. The extent of the losses to this crop is strikingly shown by the statistics given in Freight Claim Prevention Bulletin No. 371, issued by the freight claim division of the American Railway Association. This bulletin gives a statistical summary of the amounts paid for loss and damage on fresh fruits, melons, and vegetables for 1930. During that year tomatoes stood first in average amount of loss per car lot, with \$40.04 as compared with an average for all commodities of \$11.25. The total amount paid for loss and damage of tomatoes was \$1,366,783, an amount exceeding that paid for any of the other 25 commodities listed. Grapes stood second in total claims paid, but more than twice as many car lots of this fruit were shipped, and the average amount paid per car lot was only \$16.32. A summary of information available in the reports of the food-products inspectors furnishes information of value in further work on this problem.

FOOD-PRODUCTS INSPECTION CERTIFICATES AS A SOURCE OF PLANT-DISEASE INFORMATION

Food-products inspection certificates have been used in previous studies as a source of information on the severity and distribution of diseases of several crops.¹ As such a source these certificates have certain limitations. Of necessity they represent a relatively small percentage of the total number of car lots shipped. The inspected car lots are not equally distributed among producing regions but tend to be grouped in States that market their crops by certain methods. Unfavorable market conditions tend to make buyers critical, and this fact results in a larger number of calls for inspection. Moreover, the conditions under which the inspections are made preclude microscopic examinations and necessitate identification of diseases by symptoms. Obviously, such information is more easily and

¹ ROSE, D. H. DISEASES OF APPLES ON THE MARKET. U. S. Dept. Agr. Bul. 1253, 24 p., illus. 1924.

DISEASES OF STRAWBERRIES ON THE MARKET. U. S. Dept. Agr. Circ. 402, 8 p., illus. 1926.

RAMSEY, G. B., and BAILEY, A. A. TOMATO LATE-BLIGHT ROT, A SERIOUS TRANSIT AND MARKET DISEASE. U. S. Dept. Agr. Circ. 169, 11 p., illus. 1931.

BROOKS, C. SPOILAGE OF STONE FRUITS ON THE MARKET. Unpublished manuscript.

STEVENS, N. E. MARKET DISEASES OF STRAWBERRIES FROM THE SOUTHEASTERN STATES, 1926 TO 1930. U. S. Dept. Agr. Circ. 219, 4 p. 1932.

safely handled on the basis of a single disease in a limited area. But if further progress is to be made soon in the study of the distribution of diseases of fruits and vegetables on a national basis, it will be necessary to utilize all available sources of information.

The advantages of these certificates, unique in certain respects, are not recognized so generally as their limitations and may be summarized briefly. (1) The certificates represent information regarding diseases in products that are on the market. In spite of the progress in market pathology made during the past 15 years, American plant pathology still is concerned predominately with production problems. Crop-loss estimates are still furnished chiefly by those concerned with production problems. (2) The food-products inspection certificates are the result of observations made by a group of observers scattered among different markets. This eliminates the possibility of personal error in the work of a specialist in whose mind a single disease may assume undue importance. The inspectors are trained by pathologists experienced in market work, and in the larger markets there are pathologists regularly available for consultation.

DISEASES OF TOMATOES IN TRANSIT

Reports from Mexico and those tomato-producing States having the largest number of market-inspection certificates for this crop, namely, California, Florida, Mississippi, Tennessee, and Texas, have been included in the following summary. In the computations were included only records showing at least 10 inspection certificates per month from a given State.

Over 109,000 acres of tomatoes were grown for the fresh-fruit market in 1930 by the five States considered. This constituted about two-thirds of the commercial tomato acreage reported as grown for the fresh-fruit market in the United States. The total commercial acreage in the United States, including the large quantity of tomatoes grown for manufacture, is over 500,000 acres. A summary of the principal diseases reported for these important tomato-shipping States during the last nine years may well serve as a basis for more intensive study and will certainly add to the present knowledge on the distribution of tomato diseases.

The tomato-inspection certificates show more than a dozen rots that are recognized by the inspectors. Of these, six, namely, *Rhizopus* (*Rhizopus nigricans* Ehr.), *Phoma* (*Phoma destructiva* Plow.), bacterial soft (*Bacillus carotovorus* L. R. Jones, *B. aroideae* Town., and probably others), soil (*Corticium vagum* Berk and Curt.), blossom end (believed to be nonparasitic), buckeye (*Phytophthora terrestris* Sherb.), are believed by pathologists who have had long experience in market pathology and many contacts with food-products inspectors, to be sufficiently distinctive and sufficiently well known by inspectors so that the diagnosis may be considered reliable. Among the diseases which are lumped under Other Diseases in this summary are included the following: Anthracnose (*Colletotrichum phomides* (Sacc.) Chester), *Alternaria*, *Fusarium* (*Fusarium lycopersici* Sacc.), late blight (*Phytophthora infestans* (Mont.) DBy.), and nailhead (*Macrosporium* spp.).

The yearly losses in inspected shipments from the five States and Mexico are set forth in Table 1 and summarized in Table 2. *Rhizopus* is the most important single cause of decay of tomatoes in transit as it is in the case of strawberries. *Phoma* rot comes second and the bacterial soft rots third.

TABLE 1.—Percentages of tomato losses in transit from different States caused by various diseases, as shown by reports of food-products inspectors, 1922-1930

[T=trace]

FROM CALIFORNIA

Year	Cars inspected	Rhizopus rot	Phoma rot	Bacterial soft rot	Soil rot	Blossom end rot	Buck-eye rot	All other rots	Disease index ¹
	Number	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	
1922	97	5.1	3.8	1.4	0.3	0.4	0.1	3.7	14.8
1923	123	4.9	4.0	.8	.7	.1		1.2	11.7
1924	102	2.8	2.1	5.8	.6	.3	.3	3.1	15.0
1925	160	3.0	1.7	.5	1.2	.3	.7	1.2	8.6
1926	159	3.4	1.7	1.6	1.3	.2	1.2	2.8	12.2
1927	284	2.9	.8	.8	.8	.1	.3	11.3	17.0
1928	53	5.2	.4	1.2	1.1			.9	8.8
1929	159	2.7	.4	1.5	.6				5.2
1930	299	4.9	1.9	1.9	.2	.1		3.2	12.2

FROM FLORIDA

1922	13	0.9	17.4		0.5			0.9	19.7
1923	500	3.1	5.2	1.3	1.3	T	T	.3	11.2
1924	339	2.4	4.0	1.5	.4		0.1	1.0	9.4
1925	426	2.7	4.7	1.2	1.0	T	T	.2	9.8
1926	206	2.8	1.4	1.3	2.3	T	.5	1.0	9.3
1927	371	2.9	1.0	.7	1.7	T	T	.5	6.8
1928	365	4.4	2.9	2.6	.5		T	.7	11.1
1929	404	2.4	2.4	2.4	.6	0.1	.1		8.0
1930	292	2.2	4.5	1.7		T	.1	.4	8.9

FROM MISSISSIPPI

1922	24	0.3	2.0	0.2				1.9	4.4
1923	67	2.1	5.6	2.2	1.9			.2	12.0
1924	118	3.5	.3	2.3	.3	T		1.2	7.6
1925	67	1.5	.3	2.6	1.0	0.6		1.0	7.0
1926	94	1.6	.4	2.2	1.0	.4		1.0	6.6
1927	79	1.8	1.1	2.6	.6	.1		.3	6.5
1928	119	2.6	1.0	2.4	2.7	T		.2	8.9
1929	124	2.0	1.1	2.2	.8	.1			6.2
1930	98	1.2	.1	2.0	.2	.4		.1	4.0

FROM TENNESSEE

1922	17	3.8	0.3	2.9	0.9			3.9	11.8
1923	10	3.2	5.2	3.2	.2			1.0	12.8
1924	31	1.9	.9	1.0	1.2	0.7	0.3	.7	6.7
1925	70	5.0	.1	3.6		1.2	.3	.9	11.1
1926	43	1.4	.2	4.6	.9	.7	T	2.7	10.5
1927	29	.7		.9		.5		.9	3.0
1928	75	2.7	.5	2.1	1.0			.8	7.1
1929	86	2.1	.3	2.1	.5	T	0		5.0
1930	95	3.0	.2	4.2	.4	.3	T	.2	8.3

FROM TEXAS

1922	24	3.1	1.0	1.0	1.3	0.1		4.9	11.4
1923	43	2.5	1.4	1.1	.3	.8		1.1	7.2
1924	83	2.1	.4	1.4	.7	.2	0.6	3.1	8.5
1925	88	1.4	.1	1.7	.2	.6		1.6	5.6
1926	170	5.8	.4	2.3	.5	.1	T	.4	9.5
1927	137	2.4	.6	2.9	.6	.1		1.3	7.9
1928	202	1.9	.7	1.6	.7	.1	.1	.1	5.2
1929	258	2.8	.7	3.0	.7	.1	T		7.3
1930	483	1.8	1.1	2.0	.9	.1	T	.4	6.3

¹ "Disease index" is a term used by Rose (see p. 7 of first citation, footnote 1) to designate the sum of percentages of the various diseases. It is not a true percentage but is of value as a basis for comparing various coordinat elements in the tabulations.

² The marked increase in percentage of All other rots in California in 1927 is due to the outbreak of late blight (*Phytophthora infestans*) described by Ramsey and Bailey (see footnote 1).

TABLE 1.—Percentages of tomato losses in transit from different States caused by various diseases, as shown by reports of food-products inspectors, 1922-1930—Con.

FROM MEXICO

[T=trace]

Year	Cars inspected	Rhizopus rot	Phoma rot	Bacterial soft rot	Soil rot	Blossom end rot	Buck-eye rot	All other rots	Disease index ¹
	<i>Number</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	
1923.....	27	1.2	0.3	1.0	1.4	-----	-----	1.7	5.6
1924.....	40	2.0	.6	1.1	.4	0.4	0.2	.8	5.5
1925.....	44	1.7	.6	4.5	.8	-----	.8	.6	9.0
1926.....	117	1.8	4.4	1.2	-----	.1	.3	1.5	9.3
1927.....	350	1.9	1.6	.9	.5	T	.1	.8	5.8
1928.....	183	2.5	.8	1.1	.3	T	-----	1.2	5.9
1929.....	313	3.9	.7	1.3	.2	T	T	1.5	7.6
1930.....	433	1.4	1.0	.3	.3	T	.1	2.1	5.2

TABLE 2.—Average percentages of tomato losses in transit from certain States and Mexico, caused by diseases indicated, as shown by reports of food-products inspectors, 1922-1930

Year	Total cars inspected	Rhizopus rot	Phoma rot	Bacterial soft rot	Soil rot	Blossom end rot	Buck-eye rot	All other rots	Disease index
	<i>Number</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
1922.....	175	3.7	3.8	1.2	0.5	0.2	T	3.4	12.8
1923.....	770	3.2	4.7	1.3	1.2	.7	T	.6	11.7
1924.....	718	2.5	2.3	2.2	.5	.2	0.2	1.6	9.5
1925.....	855	2.8	2.8	1.6	.8	.3	.2	.6	9.1
1926.....	789	3.2	1.5	1.9	1.3	.1	.4	1.4	9.8
1927.....	1,250	2.4	1.1	1.2	.9	-----	.1	3.1	8.9
1928.....	997	3.2	1.5	2.0	.8	T	T	.63	8.1
1929.....	1,374	2.8	1.2	2.2	.6	.1	T	.34	7.2
1930.....	1,700	2.4	1.7	1.6	.6	.1	T	1.3	7.7
1923-1926.....	3,132	2.9	2.8	1.7	.9	.3	.2	-----	10.0
1927-1930.....	5,321	2.7	1.4	1.7	.7	.1	T	-----	8.0

During the period under consideration there has been an apparent decline in the total amount of decay, although this has not been marked and may be accounted for largely by the increased number of inspections requested in recent years as the inspection service grew in public confidence, and the resultant increasing tendency to request inspections on car lots that showed only slight damage.

For the present, disregarding 1922, when there were comparatively few inspections, and comparing the 4-year period 1923 to 1926 with the period 1927 to 1930, the only disease in which there is a marked reduction is Phoma rot, which averaged 2.8 per cent during the former period and 1.4 per cent during the latter. The inspections considered in this summary are, of course, all made at destinations and under fairly well standardized regulations. Therefore they would afford a good basis for comparing the diseases in the different States if it were not for the great differences in lengths of haul to the large markets. It is probable, for example, that the high percentage of Rhizopus rot in tomatoes from California may be due, in part, to the long haul. Losses from Phoma rot are decidedly higher in Florida than in any other State.

